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# **The New European GreenBuilding Programme to Promote Energy Efficiency Investments in non-Residential Buildings**

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# Objectives of the GreenBuilding Programme

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- GBP is designed and will be operated in order to contribute to the EU objective to **reduce energy demand in buildings**.
- GBP main goal is to **stimulate “additional” cost-effective** energy efficiency and renewable energies projects in **non-residential** buildings.
- GBP will help and facilitate the implementation of the new Directive on Energy Performance of Buildings (EPB Directive) by promoting and disseminating its requirements.
- The objective of the GBP is to help overcome **most of the barriers** to energy efficiency and renewables in buildings - in particular the **lack of interest and information, technical capabilities** and **access to finance**.

# Objectives of the GreenBuilding Programme

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- GBP will also **complement the EPB Directive** by stimulating energy efficiency measures in **existing** buildings, in particular by stimulating energy efficiency in **smaller refurbishments** (compared to what required by the EPB Directive) and/or by stimulating only energy efficiency projects (without building refurbishment, for example for office equipment, lighting, HVAC) and by introducing mandatory energy management in building (not cover by the EPB Directive).
- GBP will create a set of **resources and building examples** to facilitate the technical developments associated with the EPB Directive

# HOW ?

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by **providing information and technical support**, including information about:

- energy management and energy audit;
- building and system upgrades;
- M&V;
- ESCOs and financial opportunities;

to **companies wanting to commit to adopting energy-efficient measures** (both equipment/building upgrading and energy management practices) in buildings and by providing **public recognition** for their efforts and results.

# The GreenBuilding Approach

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- GreenBuilding applies to individual buildings and or to companies (corporate commitment), when they decide to apply GreenBuilding to 30% of the building space;
- Greenbuilding cover both existing buildings (this is the main target of the GBP) and new buildings;

# The GreenBuilding Approach

In the case of an existing building:

- A company/organisation becomes Partner when they decide to upgrade an existing building, following the recommendations of the energy audit provided that the upgrades pass the profitability test. The criteria (use of best technology and no possible cost-effective more efficient alternative).
- The company can choose a whole building energy approach or a modular approach (e.g. renovating only a specific end-use sector, e.g. air-conditioners, lighting, etc. - see next slide), provide the chosen module captures a large part of the potential energy savings.

# Areas of Action in GreenBuilding

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## Electricity loads:

- Lighting;
- Office Equipment;
- Electric Appliances (refrigeration, washing, cooking);
- Distribution Transformers and UPSs;
- Lift and elevators;
- Heat pumps;
- Air-conditioning and Ventilation;

## Other fuels:

- Heating, water heating and steam (boilers);
- co and tri-generation;

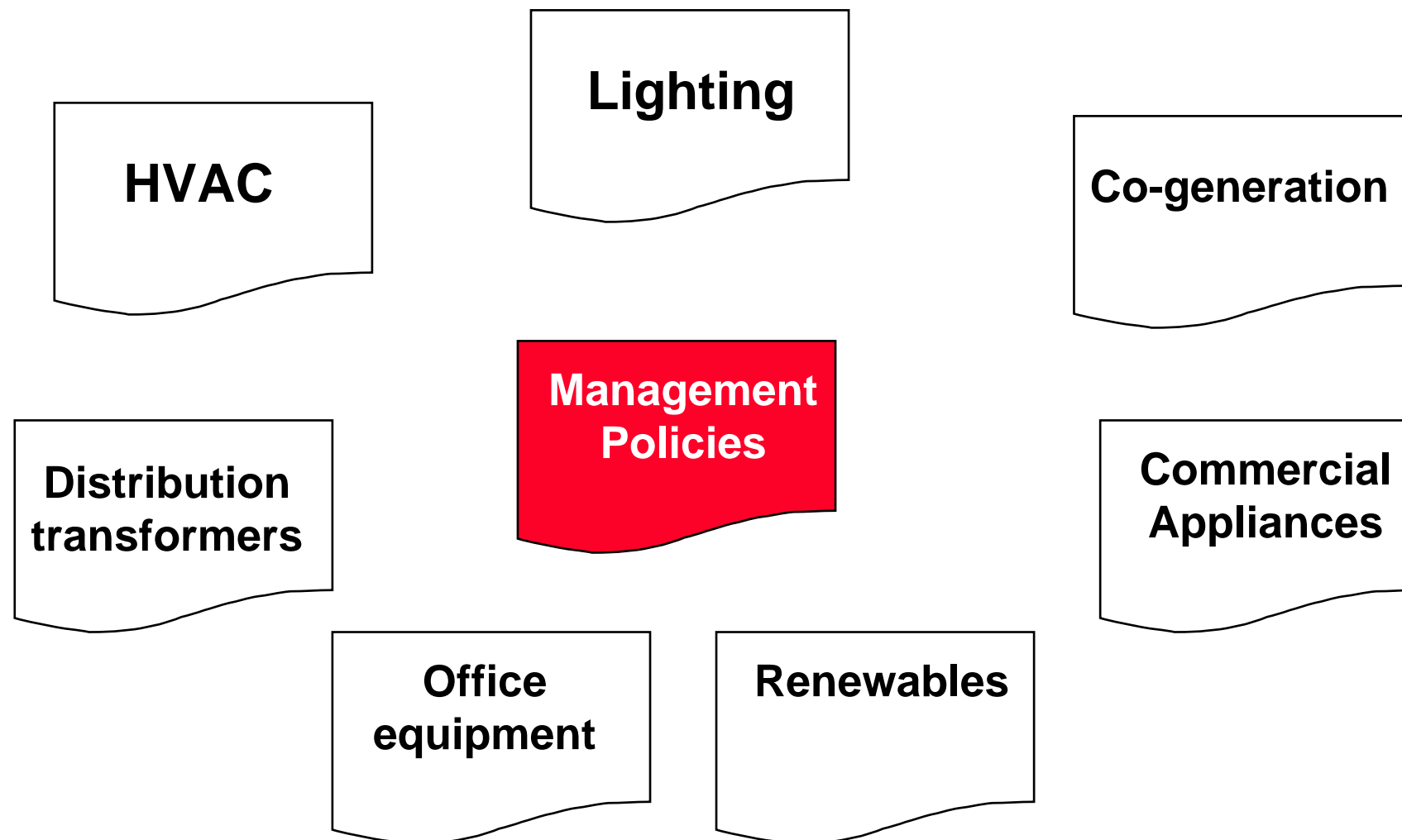
## Building shell (insulation, windows);

## Passive cooling, heating and natural ventilation;

## Renewable Energies (solar, biomass, etc.);

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# GreenBuilding Modules





# Contents of the Modules

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- 1. Guide on how to do the energy audit for the relevant systems:**
- 2. Typical technical information on efficiency improvements for the equipment/system concerned, including:**
  - System Design (size, topology, etc.);**
  - Equipment Selection (including alternatives system/equipment);**
  - Equipment and system control;**
  - System Operation and Maintenance;**
- 3. Tips on how to formulate a Action Plan and how to report**

# Procedures in the GreenBuilding Programme

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1. Initial Building **Energy Audit** by the company willing to join for any building(s)
2. The company submits a building(s) **Action Plan** defining:
  - key characteristic of the building(s) to be upgraded
  - energy efficiency and renewable actions and specific measures to which the commitment applies:
    - HVAC
    - and/or Lighting
    - and/or Commercial appliances
    - and/or Co-generation
    - and/or Office equipment
    - and/or Renewables
    - and/or Boilers and Water Heaters

# Procedures in the GreenBuilding Programme

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2. (cont'd). The company submit the Energy Management Plan.
3. If the Action Plan is approved by the EC, the Company is granted the status of **Partner** at least until the building upgrade is completed and for an initial period of three years
4. Partners **execute** their Action Plan
5. Partners are expected to **report** annually on their progress
6. The EC **renews** Partner status every year, upon review of the annual report. If no additional projects/buildings are submitted 3 years after the last project completion Partner Status will expire.

# Procedures in the GreenBuilding Programme

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- In the case of New Buildings, a full description of the expected energy performance of the new building together with the technologies used is required. The guiding principle for New Buildings is that the building shall consume 35% less energy of the building standard in force at the time or of a “conventional” new building presently constructed.
- Building completed or renovated/refurbished within the last 5 years (refurbished after on 1.1.1999), are to be treated as New Buildings. In this case the detailed record of the energy performance before and after the refurbishment has to be presented together with a description of the systems/equipment upgraded. At least 30% of energy has to have been saved or building shall consume 30% less energy of the building standard in force at the time or of a “conventional” new building presently constructed

# Possible Content of the A/C Module

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- **Measurement of cooling loads;**
- **Properly sizing of cooling systems;**
- **Upgrading of the existing cooling system;**
  - Centralised versus unitary systems
  - Use of variable-speed drives (VSDs)
  - Replacement of chillers with new, more energy-efficient, non-chlorofluorocarbon (CFC) models
  - Two-pipe systems versus four-pipe systems
  - Installation of absorption chillers using recovered waste heat
  - Zoning requirements
  - Use of poli-generation systems
  - Use of solar assisted air conditioning systems
  - Use of district heating and cooling networks
- **Optimisation of operation of heating and cooling systems;**

# Key principles of the GreenBuilding Programme

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- **Elevate** decision-making about efficiency in buildings to senior corporate officials.
  - Appoint **GreenBuilding Manager** in the company.
  - “**à la carte**” commitment.
  - The programme contains **Modules** defining the technical nature of an appropriate commitment for each energy service. Modules recommend:
    - cost-effective measures (IRR > 20% or LLCC)
    - which maintain or improve working conditions (air quality, lighting quality, etc.)
  - Obligation to **Report** building projects and data.
  - Adoption of company **Energy Management Policy**.
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# Key principles of the GreenBuilding Programme

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- The "**Management Policies**" Module is required by all participants and is supposed to aid them in making energy efficiency an element of management priorities at every step of the life cycle of a building.
  - Results of DoE energy management programmes showed that up to 80% of the savings could be attributed to the energy efficient practices of staff and the operations and maintenance staff.
  - Examples include continuous and preventive maintenance, building commissioning, equipment purchasing policies (e.g. LCC), continuous monitoring of energy consumption.

# Key principles of the GreenBuilding Programme

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- Easy reporting.
- Based on IPMVP.
- Spread sheet to account for building consumption and technologies installed before and after the upgrade as been implemented.
- Facultative simple benchmarking tool.



# Benefits for participants in the GBP

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- Direct **financial** benefits by saving money and in most cases improving working conditions.
- Indirect benefits resulting from the **growing attention** of consumers and investors.
- Possibility to link the project to national **CO2 emission** reduction programme or other (Green/White certificates).
- **Information** resources.
- **Public recognition/endorsement**.

# Benefits to public authorities

- Support for other programmes such as **Energy Star, Audit;**
- No need for **direct financial incentives** to trigger energy efficiency/renewable projects;
- Building up of **building data set** for case studies and benchmarking exercise;
- Possibility to test/verify early versions of the integrated new **measurement test** for building energy performance;
- Early **implementation of building Directive** and possibility of testing of national building certification schemes. It goes beyond the Directive as also small refurbishments are included and specially targeted;
- Establishment of effective **public/private partnerships;**

# Other important & positive “side” effects

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- Helps promoting the Energy Service and **ESCOs** industry.
- Foster a **real integration** at building level of energy efficiency and renewables.
- Promote the energy efficiency and renewable industry.
- Promote the role of the **Energy managers** as a professional figure.
- Create awareness for important practices such as **M&V, energy audit, continuous maintenance, commissioning, “Green” procurements, Life Cycle Costing.**

# Expected results

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- The GBP focuses on the existing stock of buildings as it represents the largest potential for improving energy performance in the short and medium term, promoting energy efficiency also in minor refurbishment;
- The GBP is compatible with the Building Directive, EMAS and ISO 14000;
- The GBP intends to facilitate the implementations of the Building Directive by fostering the introduction of efficiency improvements; the use of building certification; the inspection of heating and cooling plants, initially on a voluntary basis;
- The GBP integrates the lessons learned in the previous EU voluntary schemes and SAVE studies and projects.

# Expected results

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- The GBP is expected to start with 10-20 pilot partners in the first pilot phase (June 2004)
- then 100 Partners in its first two years and 100 more new companies/buildings every year as the programme gains public image.
- Partners will belong to the private and public sectors.
- Expected savings of at least 385,000 tCO<sub>2</sub>/year after a 5 year period (based on GreenLight where the average Partner will have achieved ca. 350 tCO<sub>2</sub> annual savings)
- In addition, the GBP shall foster **active energy services, ESCOs and energy audit and M&V**

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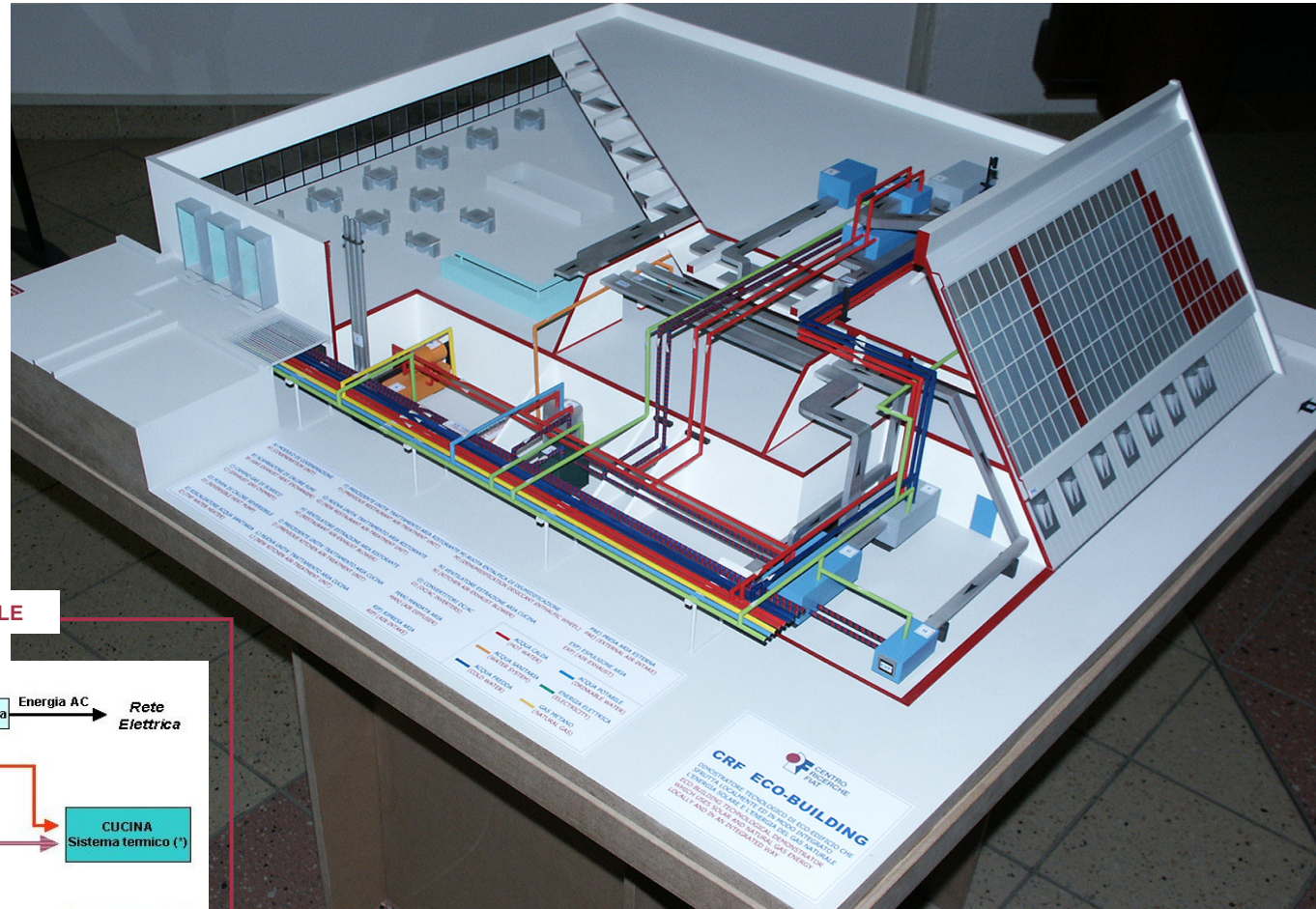
# Some Examples of GreenBuilding Projects with Improved Cooling System



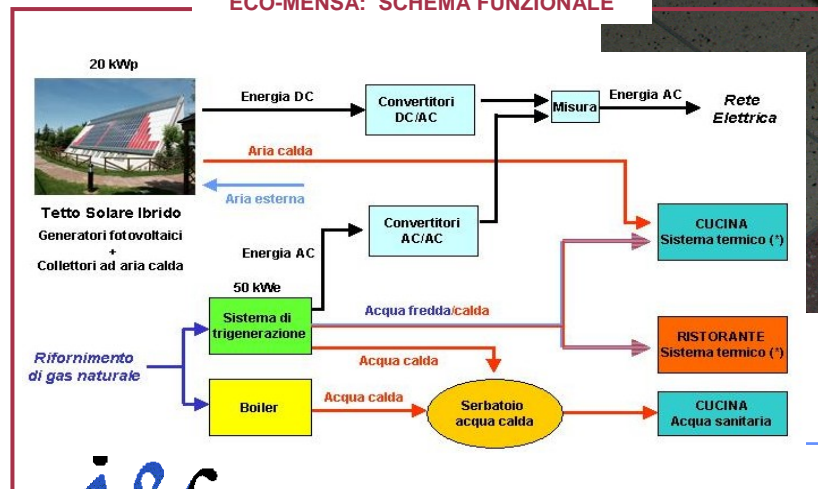
# CRF Canteen: Architecture and functional scheme

**In winter** the heat produced by the roof and by the cogenerator is used for space heating.

**In summer** the heat produced by the roof and by the cogenerator is used to dehumidify the fresh air. The cold produced by the heat pump cools down the air. Surpluses of the cogenerator waste heat are used for preheating water for cooking and then reducing the gas consumption.



ECO-MENSA: SCHEMA FUNZIONALE



**In all seasons** the electrical power produced by the roof and by the cogenerator is used to drive the heat pump and to feed the kitchen and the canteen demand.

Source: P. Campanile - CRF Italy

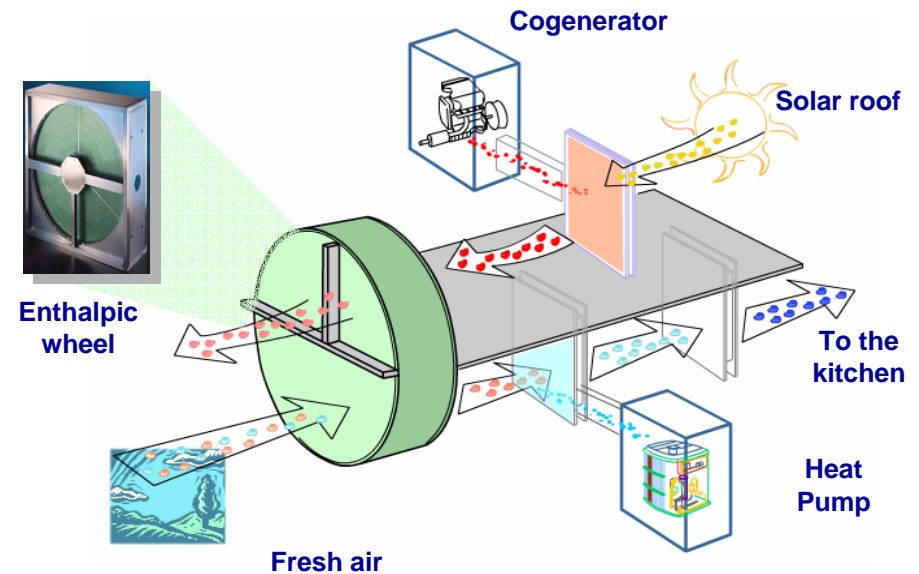
# CRF Canteen: The climatisation system

The air treatment and climatisation systems were completely redesigned based on a concept that maximises comfort and efficiency.

The system is based on **desiccant cooling**: the fresh air is first dehumidified in a controlled way, by means of an enthalpic wheel, then is cooled by means of the heat pump. In such a way the cooling demand for the climatisation is substantially reduced.

Such benefit is “energetically free”, being obtained from the waste heat of the cogenerator and of the roof.

The control strategies are based on the control of the humidity and of the perceived comfort, competence matured in the automotive applications.



## Winter

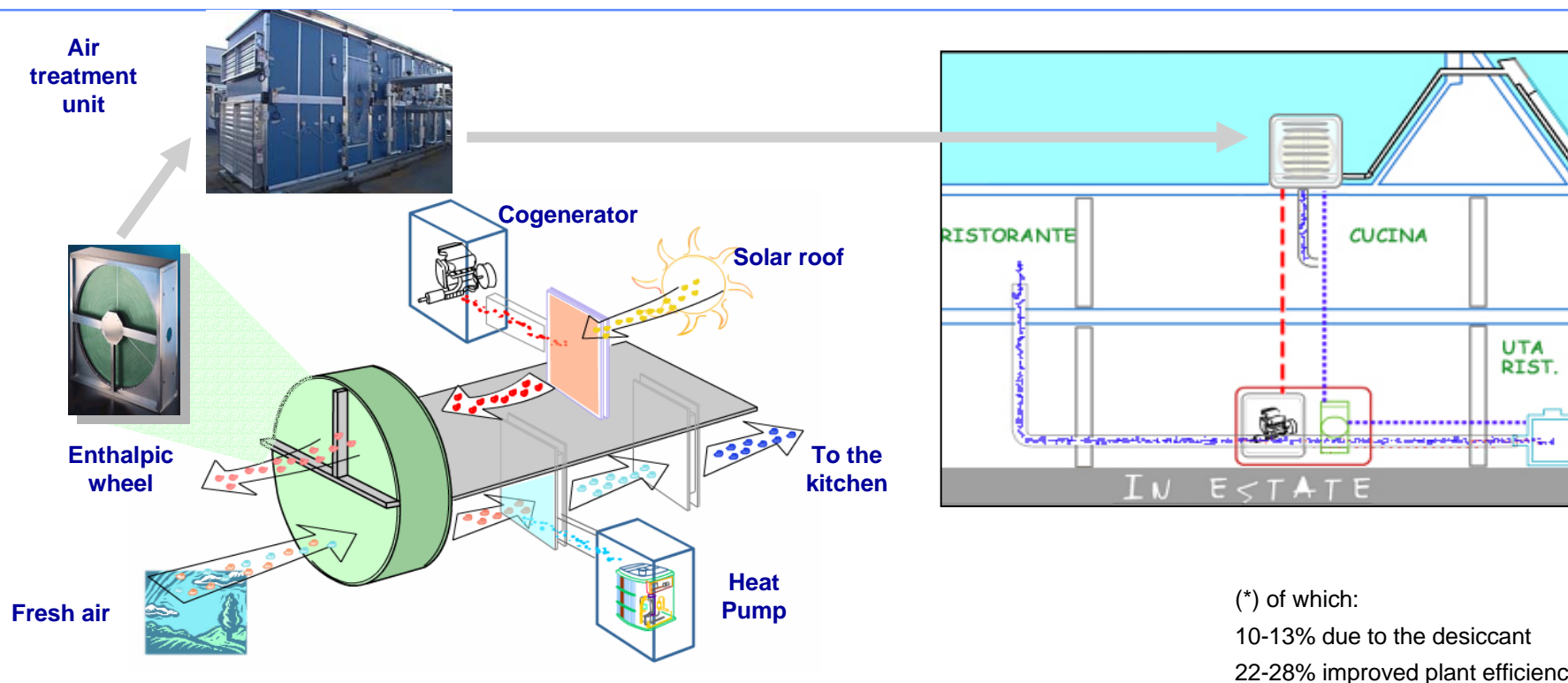
- The hot air produced by the roof preheats the fresh air for the kitchen
- The waste heat of the cogenerator preheats the fresh air for the restaurant and for the kitchen
- The heat pump integrates the space heating for the restaurant and for the kitchen.

## Summer

- The hot air produced by the roof and the waste heat of the cogenerator regenerate the enthalpic wheel system
- Surpluses of the cogenerator waste heat are utilised in the kitchen for cooking uses
- The heat pump produces cold for the climatisation of restaurant and kitchen.



# CRF Canteen: Efficiency of the climatisation



	Space heating demand	Primary energy monthly	Surplus electrical power	Climatisation demand	Primary energy monthly	Surplus electrical power
Old plant	215-340 kW	3,5-5,5 tep	-	230-360 kW	3,4-5,2 tep	-
New plant	172-269 kW	2,3 tep	10-35 kW	60-217 kW	2,3-3,1 tep	0-30 kW

Saving of primary energy

34%-58%

32-41% (\*)

## Corso Venezia Milano

- VRF (Variable Refrigerant Flow) inverter-drive multisplit system: water heat source heat pumps (n.15) two-pipe system for simultaneous Cooling/Heating operation. *Heat and cold are "moved" from one side of the building to the other*
- Lighting power less than 80W/m<sup>2</sup> instead of standard 150W/m<sup>2</sup> on 1500 m<sup>2</sup> surface
- T5, metal halide (and incandescent lamps just for luminaries' effects)
- Integration of modern technologies in historical building

### Improvements:

- Lighting energy saving
- Air conditioning energy savings

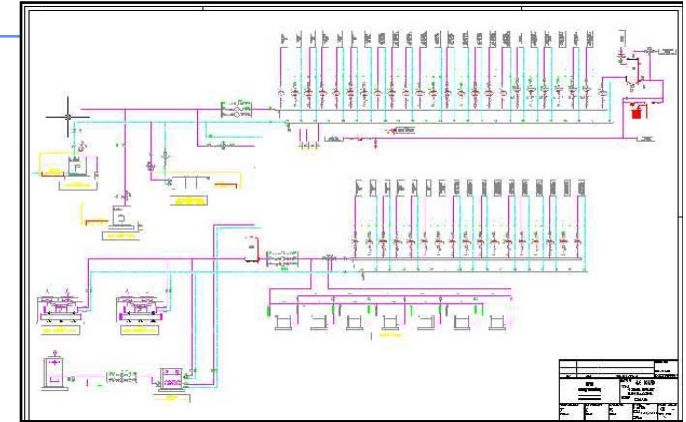


## 2 new office buildings and factories

- “MultiGeneration” :
  - Cogeneration
  - Condensing boilers
  - Electric Chillers
  - Absorption groups
  - Ice accumulation banks
- All variable speed pumps
- Fully integrated optimisation control system
- Cost optimisation minute per minute

## Improvements:

- Energy saving
- Flexibility
- Environment compatible
- Energy availability granted (!!)



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**THANK YOU**

**FOR MORE INFO**

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**<http://energyefficiency.jrc.cec.eu.int/>**